

REMARKS

Reconsideration is respectfully requested.

Status of Claims

Claims 19, 32 through 38, 43, 45, 63, and 64 have been cancelled.

No claims have been withdrawn.

Claims 66 through 68 have been added.

Claims 1 through 31, 39 through 42, 44, 46 through 62, 65, 66 and 67 are pending in this application.

Rejection

Claims 1 through 31, 39 through 42, 44 and 46 through 65 have been rejected under 35 U.S.C. §102(b) as being anticipated by the “POLYACRYLAMIDE (PAM) A New Weapon in the Fight Against Irrigation-induced Erosion” publication (hereinafter referred to as “the New Weapon document”).

In the rejection of the claims of the application, it is alleged that:

Note particularly the disclosure in the second column of the first page and the first column of the second page of the publication. The application of PAM by a sprinkler is considered to include misting since some misting would always necessarily occur with irrigation. Note the disclosure of water in the middle of the second column on the first page of the publication.

In looking to the New Weapon document, it is submitted that the discussion in that document is 1) directed to the use of PAM for surface irrigation in a flow of water in a furrow, and 2) lacks any disclosure of many of the claimed aspects of the spray application of the PAM-water mixture recited in the claims.

In particular, the discussion in column two of page one of the New Weapon document is clearly directed to the use of PAM with surface

irrigation in a furrow, as it evident in several portions of the text in column two. At lines 21 through 23 of column two of the New Weapon document, it states (emphasis added):

In furrow irrigation this has produced dramatic erosion reduction and infiltration stabilization: with very small PAM applications per irrigation, 1 lb/acre (about 1 kg/ha).

This portion of the text of the New Weapon text directly references the use of PAM in “furrow irrigation”, which has nothing to do with spray application, and indicates to one of ordinary skill in the art considering this reference that the discussion in this portion is applicable to surface furrow irrigation.

Further, at lines 24 through 30 of column two, the New Weapon document states (emphasis added):

Water-applied PAM increases soil cohesion and strengthens the aggregates it contacts in the furrow by binding exposed soil particles together more securely. This greatly reduces detachment and transport of sediments in irrigation runoff. Soil erodibility at the soil water interface is ' reduced by improved inter-aggregate bonding and better maintenance of surface roughness.

In this portion of the text, the New Weapon document addresses conditions in the irrigation furrow as the water flows through the furrow, and problems in sediments in runoff that are not of any significance in spray application of a PAM-water mixture.

Also, in column two, lines 30 through 34, the New Weapon document states (emphasis added):

PAM also acts as a settling agent. It flocculates (clumps together) the, fine particles dispersed by and carried in the flow, causing them to settle to the furrow bottom. Fewer dispersed fine particles-remain in the infiltrating water to block pores and reduce infiltration rates.

Again, the text here from the New Weapon document addresses problems that are encountered in the flow of surface furrow irrigation, and have no application to spray irrigation.

Still further, at lines 38 through 42 of column two of page one, the document states (emphasis added):

Additional factors that may contribute to reduced erosivity of PAM-treated irrigation water may include induction of laminar flow, changes in viscosity and/or surface tension of water near the soil-water interface. The combination of all these effects has reduced soil loss up to 99%, and typically around 90-95%.

One of ordinary skill in the art, reading this portion of the New Weapon document, would understand that surface furrow irrigation is being referenced here, particularly in the reference to "laminar flow", and not any spray application of any PAM-water mixture to the surface of the soil to be stabilized.

The references to surface furrow irrigation—and not spray application—continues in lines 43 through 48 of column two, where it is stated that (emphasis added):

How Is PAM applied? Erosion control has been achieved with 10 ppm PAM in the advancing furrow stream. Once the advance is complete, however, PAM need not be added to the balance of an irrigation. Thus, when expressing PAM use for the total water applied in a single irrigation, the net application is typically about 1 lb/acre-inch of water applied.

Again, the reference to "the advancing furrow stream" in the text of the New Weapon document would be recognized by one of ordinary skill in the art as something that applies to surface furrow irrigation, but has no applicability to spray application of any PAM-water mixture.

Looking to column one of page 2 of the New Weapon document, lines 2 through 10, which states (emphasis added):

Injection of PAM into furrow streams should stop shortly after runoff begins. PAM treatment has usually been by injection of small amounts of concentrated stock solutions into the irrigation water supply. There is some indication that direct powder addition may be feasible, but the concept has not been extensively tested. The 10 ppm furrow advance treatment should be applied for the first irrigation of the season, and

whenever soil in the furrow has been disturbed by cultivation or traffic.

This portion of the New Weapon document further discusses situations unique to surface furrow irrigation, and not spray application.

It is therefore submitted that the second column of page one of the New Weapon document does not disclose any spray application of a PAM-water mixture. Though the second column of page one references “Water-applied PAM”, which is clearly a reference to the application of PAM in the surface furrow irrigation context. While one of ordinary skill in the art appreciates that PAM must come into contact with moisture to be effective, this does not disclose to one of ordinary skill in the art that the discussion in column two of page one, and the first half of column one of the second page, as anything to do with spray application of a mixture, as the discussion of surface furrow irrigation clearly implies the addition of PAM to water in a furrow of surface irrigation.

Now looking to lines 28 through 39 of the first column of page two of the New Weapon document, it states (emphasis added):

Can PAM be sprinkler-applied or sprayed on? Yes, but much higher rates are needed for results comparable to those seen with furrow irrigation. Furrow irrigation only treats about 25-30% of the field surface area (the wetted perimeter). Sprinkler irrigation treats 100%. Sprinkler irrigation has an additional energy component causing soil detachment and transport-water drop impact. Water drops also excavate and mix a few millimeters of soil in the erosion process. These combined factors greatly increase the amount of PAM needed to stabilize surface structure. PAM has also been found less effective when sprayed on in. a separate application step compared with irrigation-borne application.

While this portion of the text of the New Weapon document generally mentions the use of “sprinkler-applied or sprayed on” PAM, it is submitted that it does not disclose to one of ordinary skill in the art the detailed requirements of the claims. (It is noted that this portion of the New Weapon text also alludes to the problem of soil erosion that can be caused

by the “additional energy component” of “transport-water drop impact” that results in “soil detachment” from the use of sprinkler irrigation, which is one of the aspects of spray application that is mitigated by the use of an initial misting application of the PAM-water mixture.)

In a more specific discussion of the requirements of the claims, we look first to the requirements of the independent claims.

Independent claim 1 requires, in part, “applying the mixture to a top surface of soil of the land area” and “terminating the application of the mixture when PAM reaches sufficient depth penetration below a top surface of the soil”. It is submitted that the New Weapon document does not disclose or suggest to one of ordinary skill in the art these requirement of claim 1 regarding terminating the application of the mixture when the PAM reaches sufficient depth penetration, which is not addressed in the highly generalized and non-specific discussion of the New Weapon document. As noted previously, the New Weapon document is primarily directed to the use of PAM with surface furrow irrigation, and provides no guidance as to when to terminate spray application of a PAM-water mixture.

Independent claim 17 requires, among other things, the step of “applying the mixture to a top surface of soil of the land area by misting a top surface of the land area with the mixture for producing a tack coat of the PAM for initially stabilizing topmost soil particles on the top surface of the land area against soil particle movement caused by any subsequent mixture applications” and that “the applying step comprises making a series of applications of the mixture to the soil to achieve the total application rate for the soil of the land area, and temporarily terminating application of the mixture to the soil between applications of the series of application when saturation of the soil by the mixture is detected” (all emphasis added). It is submitted that one of ordinary skill in the art would not read the New Weapon document and understand that the requirements of this claim, such

as the spray application of the PAM-water mixture in a series of application, and the termination of spraying between applications, are disclosed or suggested by the document. The New Weapon document is simply too lacking in any detail about spray application to lead one of ordinary skill in the art to these specific requirements of claim 17

Independent claim 39 requires “applying the mixture to a top surface of soil of the land area until the soil of the land area becomes saturated, and stopping the application of the mixture when the top surface becomes saturated and the mixture accumulates on the surface rather than being absorbed into the ground and the mixture on the top surface reflects ambient light” and “terminating the application of the mixture when PAM penetrates below a top surface of the soil” (all emphasis added). It is submitted that the New Weapon document does not disclose the requirements of claim 39, particularly the requirements emphasized above, as the New Weapon document does not discuss the amount of mixture that should be applied, especially in relation to the condition of the soil during application. It is therefore submitted that the New Weapon document does not disclose or suggest the combination of requirements of claim 39.

Independent claim 55 requires in part “applying the mixture to a top surface of soil of the land area by misting a first portion of the total application rate of the mixture onto the surface of the land area to produce a tack coat for initially stabilizing topmost soil particles on the top surface of the land area against soil particle movement caused by subsequent mixture applications”, “temporarily terminating the application of the mixture to the top surface of the soil after the misting of the first portion of the mixture” and “resuming application of the mixture by applying a second portion of the total application rate of the mixture onto the top surface of soil” (all emphasis added). It is submitted that one of ordinary skill in the art, considering the discussion in the New Weapon document would not understand that the document discloses the steps of spray application

required by the claim. There is nothing in the New Weapon text that describes any temporary termination of the spray application of a PAM-water mixture or any resumption of spray application of a PAM-water mixture.

Independent claim 60 includes the requirement of “applying the mixture to a top surface of soil of the land area in a series of at least two applications of the mixture to the surface for the number of applications until the application rate for the soil of the land area is substantially achieved” (all emphasis added). The New Weapon document fails to disclose any detail of spray application, and in particular fails to discuss any spray application technique in which a PAM-water mixture is applied in “a series of at least two applications” as is required by claim 60, and therefore the New Weapon document could not lead one of ordinary skill in the art to the combination of requirements of claim 60..

Finally, independent claims 61 and 62, although not identical, each require “initially applying a mixture of PAM and water to a top surface of soil of the land area”, “terminating the initial application of the mixture”, making, after a time period passes after terminating the application, at least one additional application of the mixture to the top surface of the soil” (all emphasis added). Claim 61 further requires that “the initial application includes misting a portion of the total application rate of the mixture onto the surface of the land area”. As has been pointed out above, the text of the New Weapon document lacks any discussion of any techniques for spray application of a PAM-water mixture, and specifically lacks any disclosure of these steps in spray application.

Now turning to some of the dependent claims of the application, claim 2 requires that “the establishing step includes mixing PAM and water in a ratio of about 1 part PAM to between about 500 and about 5000 parts water by volume” and claim 3 requires that “the establishing step includes mixing

PAM and water in a ratio of 1 part PAM to about 1000 parts water by volume". Claims 30, 44, and 47 includes similar requirements. The New Weapon document does not disclose any ratio of PAM to water in a mixture, instead the New Weapon document discusses a rate of application to an area of land, irregardless of the soil being treated. Therefore, it is submitted that the New Weapon document would not lead one of ordinary skill in the art to the requirements of claims 2, 3, 30, 44 or 46.

Dependent claim 4 requires that the step of "determining a number of times that the mixture of the uniform mixture ratio needs to be applied to the land area to achieve the calculated total application rate of the PAM". Claims 44 and 46 include similar requirements. Claims 41, 44 and 46 include similar requirements. As the New Weapon document fails to disclose any multiple spray application of a PAM-water mixture, it is submitted that the document would not lead one of ordinary skill in the art to the requirements of claims 4, 41, 44 and 46.

Dependent claim 5 requires that "the applying step comprises making a series of applications of the mixture to the surface for a number of times until the application rate for the soil of the land area is achieved," and as discussed above, the New Weapon document does not discuss multiple spray applications to achieve an application rate. Claims 42, 44 and 46 include similar requirements, and therefore it is submitted that claims 5, 42, 44 and 46 are not anticipated by the New Weapon document.

Dependent claim 6 requires that "the applying step includes misting a portion of the total application rate of the mixture onto the surface of the land area to produce a tack coat for initially stabilizing topmost soil particles on the top surface of the land area against soil particle movement caused by subsequent mixture applications" (all emphasis added). While it was asserted in the rejection that "application of PAM by a sprinkler is considered to include misting since some misting would always necessarily

occur with irrigation,” the New Weapon document does not disclose misting a PAM-water mixture “to produce a tack coat for initially stabilizing topmost soil particles on the top surface.” Claim 44 includes a similar requirement, and for the same reason is not anticipated by the New Weapon document.

Dependent claim 7 requires that “the applying step includes continuing to apply the mixture to the surface of the soil until the soil of the land area becomes saturated and stopping the application of the mixture top surface becomes saturated.” Claims 20, 44 and 46 include similar requirements. This action is not discussed or otherwise disclosed by the general statements set forth in the New Weapon document, and there it would not lead one of ordinary skill in the art to the invention of claims 7, 44 or 46.

Dependent claim 8 requires “detecting saturation of the soil when the mixture accumulates on the surface rather than being absorbed into the ground and the mixture on the top surface reflects ambient light.” Claims 21, 44 and 46 include similar requirements. Nowhere in the New Weapon document is anything mentioned about this practice, and there it would not lead one of ordinary skill in the art to the requirement of claims 8, 21, 44 or 46.

Dependent claim 9 requires that “the applying step includes waiting for a time period after detection of saturation such that the mixture is able to penetrate the ground below the surface” and that “the time period comprises the time required for any puddles of the mixture on the top surface of the soil to be absorbed into the soil below the top surface.” Dependent claim 10 requires that “the waiting step [of claim 9] is conducted for a time period that is less than the time required for the top surface of the soil to dry.” Again, this practice is not discussed or described in any manner in the New Weapon document, and is not anticipated by the content of the document. Claims 22, 23, 44 and 46 includes similar requirements,

and for the same reasons are submitted not to be anticipated by the New Weapon document.

Dependent claims 11 and 12 regard the manner in which the PAM-water mixture is applied to the soil, and the cursory statements in the New Weapon document do not disclose these requirements. Claims 24, 25, 44, and 46 also include similar requirements.

Dependent claim 13 requires “testing the extent of penetration of the PAM below the top surface of the soil of the land area,” and claim 14 requires that “the testing step includes removing a core sample of the soil from the land area,” and the New Weapon lacks any disclosure that would lead one of ordinary skill in the art to this requirement. Claims 26, 27, 44, and 46 include similar requirements to claims 13 and 14, and are similarly not anticipated by the New Weapon document.

Dependent claim 15 requires “the step of comparing the depth penetration of the PAM below the top surface of the soil of the land area to a set of minimum depth penetration values based upon the general slope of the land area to determine the minimum depth penetration needed for the land area being treated before terminating application of the mixture to the land area” and claim 16 requires “exceeding the total application rate calculated if the sufficient minimum depth penetration is not achieved through application of mixture to the soil at the total application rate.” Again, the general statements in the New Weapon lack any mention of the claimed comparison, and would not disclose the claim requirements to one of ordinary skill in the art. Claims 29, 44 and 46 includes similar requirements, and for the reasons stated above these requirements are not disclosed by the New Weapon document.

Dependent claim 31 requires “considering the relative compaction of the soil of the land area, and increasing a number of times of applications of the mixture if the top surface of the soil of the land area has a compacted

crust for loosening the compaction of the soil to enhance the penetration of subsequent applications of the mixture into the soil" (emphasis added). The New Weapon document fails to mention any consideration of the compaction of the soil, or any adjustment made for the compaction, and therefore it is submitted that the document would not lead one of ordinary skill in the art to the requirements of claim 31. Claim 46 includes similar requirements and is also submitted to be patentable over the New Weapon document.

Dependent claim 48 requires "determining the degree of stability of the soil of the land area to be treated including testing the vulnerability to erosion of the soil of the land area to be treated", claim 49 requires that "the determining step includes providing at least a first tray, removing a sample of the soil from the land area to be treated, placing at least a portion of the soil sample in the first tray, tilting the first tray to produce a slope in an upper surface of the sample in the first tray," and claim 50 requires "pouring a first liquid on the soil sample in the first tray near an uppermost end of the first tray" (all emphasis added). None of these features of the claimed invention are discussed or suggested by the New Weapon document, and therefore claims 48, 49 and 50 are submitted to be patentable over the document. Claims 51, 52, 53, and 54 depend from claims 49 and 50, and similarly recite steps that are completely absent from the New Weapon document.

Other dependent claims pending in the patent application recite other additional features of the invention that are not disclosed by the New Weapon document.

It should also be noted that the New Weapon document identifies several of the problems discussed in the present patent application, problems which present problems not only to use of PAM use in general, and injection in surface furrow irrigation. Lines 14 through 21 of column one of page two states that (emphasis added):

Can there be problems applying PAM? Yes. Currently PAMs are most commonly produced as dry granules. They completely dissolve and remain dissolved if mixed properly (slow addition to water under strong sustained agitation). If added too quickly or if not vigorously stirred the granules rapidly form non-dissolvable gels on contact with water or collect in low turbulence areas as syrupy concentrates that dissolve slowly in an uncontrolled pattern over a period of hours or days.

These characteristics present significant problems to spray application as the spray equipment utilizes small passages (hoses, nozzles, etc.) that are more likely to be clogged by a PAM-water mixture than an irrigation furrow, although the New Weapon document (with its focus on surface furrow irrigation) does not recognize this increased danger in spray application of PAM-water mixtures.

It is therefore submitted that the New Weapon document would not lead one of ordinary skill in the art to the applicant's claimed invention as defined in claims 1, 17, 39, 55, 60 and 61, especially with the requirements set forth above, and therefore it is submitted that claims 1, 17, 39, 55, 60 and 61 are allowable over the prior art.

Further, claims 2 through 16, 18 through 31, 40 through 42, 44 and 46 through 54, 56 through 59, and 62 through 65 all depend from these independent claims and therefore include the requirements of the independent claims which they depend and were discussed above and are also submitted to be in condition for allowance.

Withdrawal of the §102(b) rejection of claims 1 through 31, 39 through 42, 44 and 46 through 65 is therefore respectfully requested.

CONCLUSION

In light of the foregoing amendments and remarks, early reconsideration and allowance of this application are most courteously solicited.

Respectfully submitted,

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Date: April 24, 2009

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